

App. No. 10/605,186

In the Drawings:

Corrected Drawings are attached.

Remarks Section:

Figure 1 has been replaced with a new Figure 1 with the identified items in the specifications.

Figure 2 has been replaced with a new Figure 2 with the identified items in the specifications.

No changes to Figure 3a.

No changes to Figure 3b.

Figure 4 has been redrawn for clarity.

Figure 5 has been redrawn for clarity.

Figure 6 has been redrawn for clarity.

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## REMARKS - General

Below are some comments that address the examiner's concerns and issues.

This invention has wide potential for use. According to Danny Sullivan, Editor in Chief of Search Engine Watch, as of February 25, 2003 over 500 million searches are performed per day on the top 8 Search engines. This does not include the queries performed on a myriad of other sites and systems. Inventions that improve these systems are important.

## Terminology

Researchers in Computer Science and Artificial Intelligence have defined a class of problems as Constraint Satisfaction Problems. One definition from Artificial Intelligence: A Modern Approach (Second Edition) by Stuart Russell and Peter Norvig follows:

Formally speaking, a **constraint satisfaction problem** (or CSP) is defined by a set of variables,  $X_1, X_2, \dots, X_n$ , and a set of constraints,  $C_1, C_2, \dots, C_m$ . Each variable  $X_i$  has a nonempty domain  $D_i$  of possible values. Each constraint  $C_i$  involves some subset of the variables and specifies the allowable combinations of values for that subset. A state of the problem is defined by an assignment of values to some or all of the variables,  $\{X_i = v_i, X_j = v_j, \dots\}$ . An assignment that does not violate any constraints is called a **consistent** or **legal** assignment. A complete assignment is one in which every variable is mentioned, and a **solution** to a CSP is a complete assignment that satisfies all the constraints. Some CSPs also require a solution that maximizes an **objective function**.

Constraint Application Problems are used in a broad array of applications. As noted from the CP-03 Workshop on Immediate Applications of Constraint Programming (ACP) September 29th, 2003

Constraint Satisfaction Problem application "areas include but are not limited to computer graphics and computer vision, natural language processing, database systems, operations research, engineering, bioinformatics as well as business applications (e.g. configuration, recommender systems, user interaction, planning & scheduling, resource management).

Other researchers have noted that text search problems may be represented as Constraint Satisfaction Problems and that general solution techniques may be applicable.

Commercial software firms develop software "configurators" for managing and solving CSP problems.

It is not uncommon that when end users use systems or applications to solve CSPs, they will enter or be guided to enter constraints into the system. For example this may be a string of text for keyword search. In addition designers (or managers) of the systems and application may embed constraints into the application. When users initially query the system (perform a search for example), these embedded constraints and the constraints users entered (or caused to be entered) form a "first group of constraints." More formally this might be stated "there exist a set of constraints." This will be described in more detail below.

By way of illustration, and not for purposes of limitation, this embodiment of the present invention has been described as applied to parametric search, and in particular parametric search as applied to an electronic database that contains circuit breakers.

More precisely defined this invention relates to a computer method and process for solving constraint satisfaction problems

## Summary of response to Krupin (US 6,751,611)

The Patent Examiner has compared the present invention to that of Krupin. The Applicant would like to point out that there are many significant differences. There are three high-level differences to point out:

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- Krupin is limited to improved text searches,
- Krupin analyzes the "current" search. Krupin does not present analysis of modified or derivative queries,
- Krupin saves queries and allows users to manually modify them. Krupin does not propose a system to allow users to automatically (with 1 click) execute modified or derivative queries.

Key benefits of the current invention as compared to Krupin:

- 1 click execution of a modified or derivative set of constraints,
- Instant analysis presented of those modified constraints. If a query is a blind alley (has no solution) a user knows this prior to execution,
- Applies to product catalogs, web searches and CSPs in general,
- Faster. (Rather than having to redo every search. Modified and derivative searches happen initially and can utilize the same intermediate set of results.)
- Allows system operators to present "alternative" related queries. For example a user can be asked if they would like to see related queries but for items in-stock or on special that share many of the constraints they are interested in.

The current invention is concerned with refining a search or query to quickly find derivative and related searches for users. (This may be phrased more precisely. It is concerned with refining the Constraints associated with a CSP to quickly find a modified set of Constraints for solving a CSP for an end user.) There exist innumerable methods to assist end users in entering or selecting a set of constraints for a search. (Krupin is one more.)

To give a simple example, a user may enter in the Google search box: "red cheap jaguars" (See Figure 7). This query may be represented as three constraints as follows:

Constraint 1: All pages where there is the text "red" on the page, and Constraint 2: all pages where there is the text "cheap" on the page, and Constraint 3: all pages where there is the text "jaguars" on the page. This search looks for pages that meet all 3 constraints.

The parametric search example used herein provides a second example (Figure 2). In the "Approvals" field a user has selected "VDE approved." In the "Handle Style" field the user has selected "Illuminated Rocker." And in the "Max Interrupting Capacity" field the user has selected 5000. These selections correspond to 3 constraints on the query.

These are 2 simple examples for how an initial set of constraints may be entered by an end user into the system. A wide variety of other methods for gathering constraints from end users have been used. These include "Advanced Search" functions found on many search menus, guided sales and product selection using question and answer, a "search builder" described by Krupin et al. ('Krupin' herein after) (US 6,751,611) and parametric search described by Danish et al ('Danish' herein after) (US 5,715,444).

In addition to the constraints that may be provided by end users as described in these examples above, it is common for manufacturers, retailers and other providers of search and query systems to implement systems that have constraints. For example configuration systems on the Internet combine text databases; product, option, and product attribute databases along with logical constraints. The Applicant figures shows a system with a constraint that the "Single Pole (Non UL/CSA)" option is not allowed with the "(-V) VDE Approved" option. In this image the user has received indications that the selection is Invalid and a message describing why it is not allowed.

Constraints entered by end users and other constraints in the system may comprise "a first group of constraints" when they are presented to our invention. At that point modified and derivative sets of constraints are created, analyzed and prepared for automatic execution by the end user.

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Searches or the solutions to queries involving Constraint Satisfaction Problems comprise an extensive set of literature. Krupin, Danish and Dorfman et al. ('Dorfman' herein after) (US 6,988,095) describe methods for building and executing searches. This invention is concerned with helping guide users to derivative and related sets of constraints for searches and queries. There exist numerous algorithms for solving these problems.

Krupin discloses a system, "the search builder" for "creating improved search queries using pre-arranged controlled vocabularies, word groups, and word types.

Krupin's invention is limited to creating text strings for searches:

- The goal of the system described by Krupin (Column 6 lines 29 to 31) is to create an intelligent query that contains a sequence of one or more words which is called the search string.
- Krupin specifies that the system is designed for use in creating text based searches. (Column 4 lines 1 to 10) "Unlike data in product databases, web content is textual and the language of web sites is ambiguous" ... "The prior art does not include any web sites using a search builder method of pre-arranged controlled vocabularies at all."

Krupin does not describe creating a related or derivative query using a modified set of constraints. (Column 11 lines 30 to 45 ) "If the feedback indicates the number of words, type of words, or number of word groups is too low or too high the user is prompted to modify his search word query." Krupin goes on to describe a manual process:

*The user may close down the search engine response and return to the search builder page listing. The user may click on the "Clear and Start Over" if they wish to create a complexly different search string query. The user may click on a particular word group and select a new, different or related search word from the controlled vocabulary in the word group of their choice. The may then click on the "search" button, and request more search results. Users will create a search string from word groups, search and browse their results, and return to modify their search string, and browse again and so on until they succeed in finding what they are looking for or give up.*

In contrast our invention describes a system designed for conditions such as where there are too many results or too few results (or other conditions set by the system provider.) This system integrates analysis of a variety of potential modified queries (sets of constraints), and integrates a method for executing these queries. The example provided shows a system for executing these modified related and derivative queries with one (click) selection by the user.

More detail:

Krupin discloses a system for performing a search query (Figure 4, Krupin) comprising:

- having user choose a first group of constraints (column 6 lines 31-39, Krupin); *This is a partial set of constraints, not a "first group of constraints.*
- having the user choose additional constraints (column 6 lines 39 – 50, Krupin); *As noted below the two steps above provides a potential "first group of constraints"*
- searching based on the first group of constraints (column 6 lines 52 – 57, Krupin);
- reviewing results of said search (column 9 lines 58 – 63, Krupin);
- determining whether or not to search using said additional constraints (column 7 lines 3-9, Krupin);
- having if it is determined searching based on additional constraints (column 7 lines 24 – 39, Krupin); and *Many systems include facilities for saving and modifying queries. Krupin describes no system for automating this procedure and helping end users execute these additional searches quickly. No system is described to help the user understand the likely results of any derivative queries.*
- Providing the results of said search (column 11 lines 1 – 9), Krupin).

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While Krupin describes a system for creating text searches. Krupin describes the need to do additional queries but does not describe a system for analyzing or easily executing those additional queries.

Krupin describes a system for modifying a search. (Many systems include such facilities.) Again Krupin does describe a system that executes subsets of potentially modified searches, analyzes potential results for the end user and then allows the user to easily execute such modified searches. In Krupin's system users must manually modify existing search criteria and then execute the modified search to understand its likely results.

With respect to claim 12, Krupin discloses a system according to claim 1 in which relaxing, tightening or modifying the constraints before reporting said results (column 2 lines 34 – 40, Krupin).

"The advanced search options allow a user to enter words of choice and the search will be conducted on "all the words", "with any of the words", as an "exact phrase" or with "none of the words". The search may also be conducted in any language or in a specified language, in any file format, or on a specific file format, or within some specified time frame. The advanced search options at most of the search engines all focus on what is done with the words that are entered, rather than on what words are selected in the first place.

Krupin does not discuss a system for automatically relaxing constraints before reporting said results. Many systems include facilities for manually modifying constraints.

It is important to note that Krupin is analyzing the first search (the search using the first group of constraints). Krupin is not analyzing the potential searches from modified or derivative sets of constraints. Users are expected to manually modify their selection by editing text or manual addition or deletion of text.

While Krupin discloses a system that includes an analysis of the search. It includes "advice" on "Words in String", "Word Groups", "Word Types" and "Targeting." Krupin does not describe a system for analyzing the number of solutions (results) for each potential subset or modified set of constraints.

Fox (US 2003/0069873) is a method for searches. It has no bearing with regards to a system for relaxing constraints, analyzing potential results and then helping users to automatically execute new queries.

Both Krupin and Danish establish there is a strong need to do modified or derivative searches or queries but the solution to the problem is not obvious. As discussed above Krupin provides a method to manually modify an existing search string but Krupin does not analyze potential derivative or modified searches and does not provide a facility for automatically executing them. Danish, column 9 lines 3 – 22, likewise discuss the problem and potential solutions in detail. Danish's solution is to force users to a specific set of criteria via "automated de-selection." Danish acknowledges that this is making assumptions about the user's priorities.

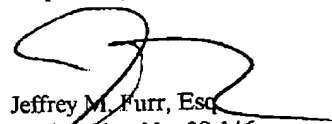
Also applicants have rewritten all claims to define the invention more particularly and distinctly so as to overcome the technical rejections and define the invention patentably over the prior art.

## Conclusion

For all of the above reasons, applicant submits that the specification and claims are now in proper form, and that the claims all define patentably over prior art. Therefore the applicant submits that this application is now in condition for allowance, which action is respectfully solicited.

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Respectfully submitted,



Jeffrey M. Furr, Esq.  
Registration No. 38,146

I hereby certify I have transmitted this paper by fax to the Patent and Trademark Office at 571-273-8300 on June 7, 2006.

June 7, 2006.



Jeffrey M. Furr, Esq, Reg. No. 38,146.

11 no label sheets  
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**AIRPAX**  
Power Protection Products

PRODUCT MODEL SELECTOR

Parameter Search      Part Number Search

Search Criteria

Series:      Desc:

Select criteria parameters below. Click "Search" to get links to the product that match your criteria.

Amplifier ?	11 1700 amplified	1 and 2 Style ?	No preference
Approved ?	LL 400 listed	Max. mounting Capacity ?	No preference
CSA/CUL	LL 400A listed	Pages ?	No preference
to disconnect	LL recognized	Terminal Type ?	No preference
	CF compliant	Max. VTA AC ?	No preference
	CSA certified	Max. VOLT DC ?	No preference
Duration ?	No preference		

Optionally you can enter additional keywords below to narrow your search.

Keywords ?      # of Words

Figure 1

Figure 1 has been replaced with  
a new Figure 1 with the items marked  
in the specifications

*Annotated Sheet*  
*101 B05, 186*

**AIRPAX**  
 Power Direction Products

PRODUCT MODEL SELECTOR

Parameter Search    Part Number Search

Search    Results

Select required parameters below. Click "Search" to get links to the product that match your criteria.

Amperage:

Approach:

Direction:

Handle Size:

Max. Operating Capacity:

Pulse:

Terminal Type:

Max. Vibration:

Min. Vibration:

Keywords:

Figure 2

*Figure 2 has been replaced with a new Figure 2 with identified items in the Specifications.*



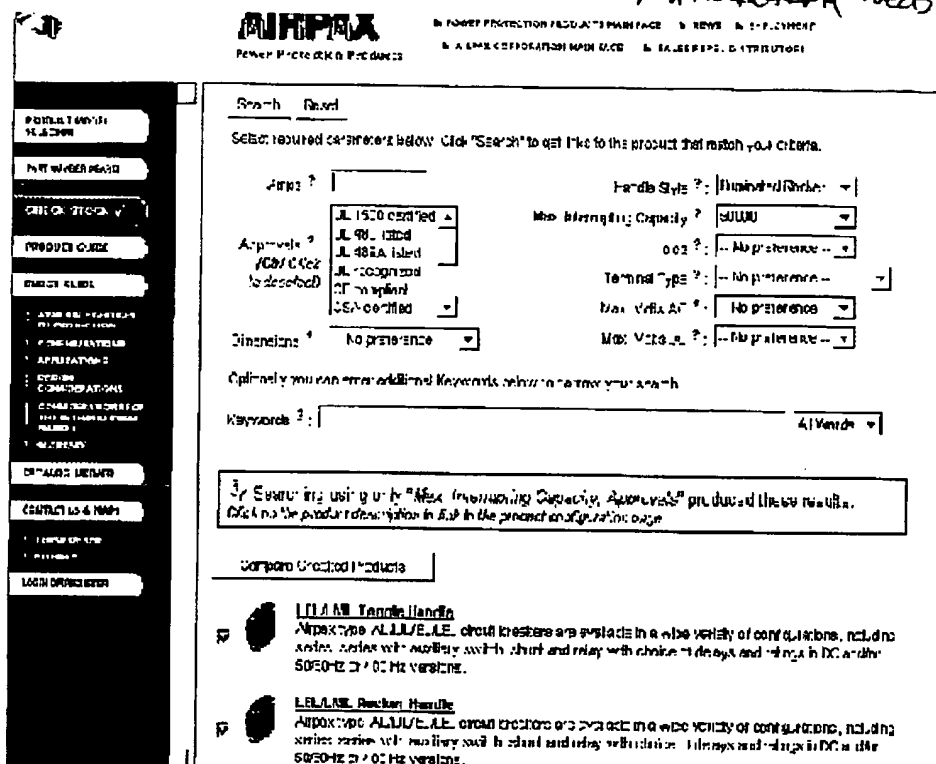
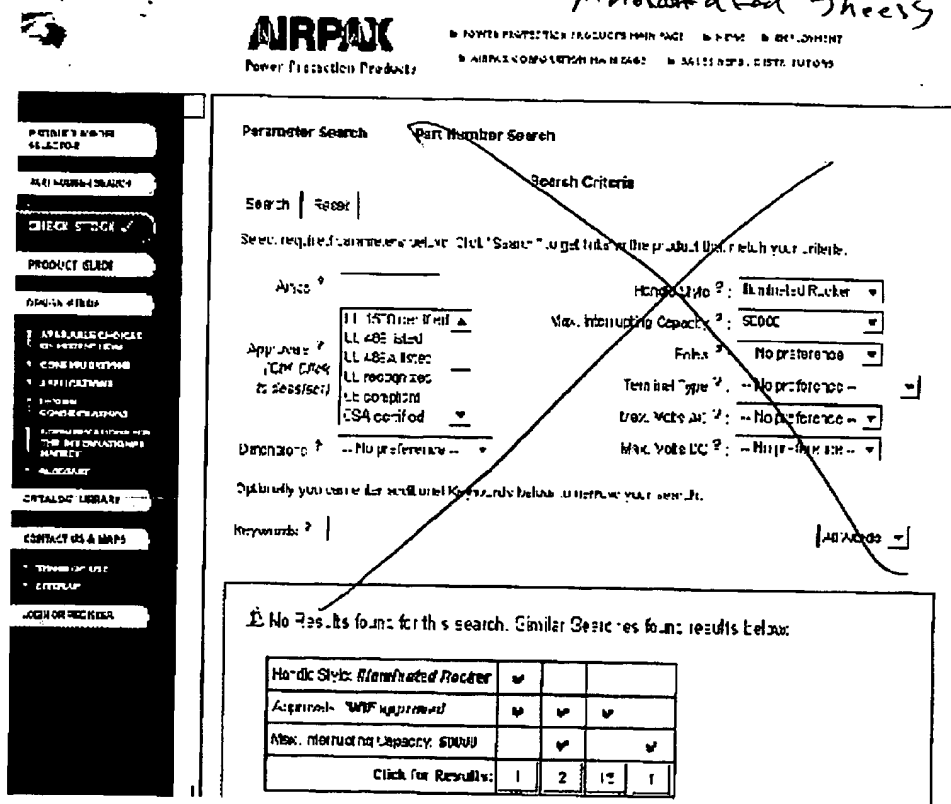


Figure 4

Figure 4 has been redrawn for clarity.



### Figure 5

Figure 5 has been redrawing for  
Clarity.

**ARRPA**  
Power Protection Products

SEARCH RESULTS

Sort By: **Relevance**

Select required parameters below. Click "Search" to get links to the product that match your criteria.

Amperage: **7.5A** **15A** **20A** **25A** **30A** **35A** **40A** **45A** **50A** **60A** **70A** **80A** **90A** **100A** **125A** **150A** **200A** **250A** **300A** **350A** **400A** **450A** **500A** **600A** **700A** **800A** **900A** **1000A** **1250A** **1500A** **2000A** **2500A** **3000A** **3500A** **4000A** **4500A** **5000A** **6000A** **7000A** **8000A** **9000A** **10000A** **12500A** **15000A** **20000A** **25000A** **30000A** **35000A** **40000A** **45000A** **50000A** **60000A** **70000A** **80000A** **90000A** **100000A** **125000A** **150000A** **200000A** **250000A** **300000A** **350000A** **400000A** **450000A** **500000A** **600000A** **700000A** **800000A** **900000A** **1000000A** **1250000A** **1500000A** **2000000A** **2500000A** **3000000A** **3500000A** **4000000A** **4500000A** **5000000A** **6000000A** **7000000A** **8000000A** **9000000A** **10000000A** **12500000A** **15000000A** **20000000A** **25000000A** **30000000A** **35000000A** **40000000A** 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